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(54) Title of the Design

VARIABLE RESISTOR

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Specification

1. Title of the design

Variable Resistor

2. Claims

A variable resistor comprising a resistor main body for changing the conductive resistance of electrode parts with the press deformation of covered pressed parts of an acting body made of an elastic material and an operating body having pressing parts capable of pressing the pressed parts is characterized by vertically providing shake prevention projections made of an elastic material adjacent to the pressed parts of the acting body, have a larger height dimension than the pressed parts and their upper ends contacting the pressing parts of the operating body.

3. Detailed description of the design

(Field of industrial application)

The present design relates to a modification of a variable resistor for changing the conductive resistance of electrode parts with the press deformation of pressed parts via an operating body, and relates particularly to a variable resistor that may prevent shaking of the operating body.

(Prior art)

A variable resistor shown in Fig. 4 has been known as this kind of variable resistor before.

This variable resistor is a seesaw type resistor having two electrodes and is constituted from a resistor main body **20** and an operating body **30** for the press operation.

The resistor main body **20** comprises an acting body **21** receiving the press operation, a pressure plate 22 and a base board **23**.

The acting body **21** is formed of an elastic material such as synthetic rubber, etc. in the shape of a rectangular plate and has two hill-like pressed parts **21a** on its upside. The upper ends of the two hill-like pressed parts **21a** are flat and have projections **21a1** for preventing shaking of the operating body **30** at the center of its upside. Disc-like conductive parts **21b** made of a con-

ductive rubber, etc. are coaxially attached downside of acting body **21** corresponding to the projections **21a1**.

The pressure plate 22 covers the upside of acting body **21**, has holes **22a** for inserting the pressed parts **21a** on it and has pressing surface **22b** in contact with the rim upside of acting body **21** on the inner side. Multiple stop pins **22c** longer than the thickness of base board **23** are formed downside of pressure plate 22.

The base board **23** comprises a printed wiring board, etc. and has electrode parts **23a** capable of making contact with the conductive parts **21b** of acting body **21** at two locations. Electrode parts attached to pressure-sensing conductive material, such as pressure-sensing conductive rubber, etc. upside of a pair of electrodes are used as these electrode parts **23a**. Stop holes **23b** capable of inserting stop pins **22c** of pressure plate 22 are formed on the base board **23**.

The resistor body **20** is assembled by mounting the acting body **21** on the base board **23**, inserting the stop pins **22c** of pressure plate 22 into the stop holes **23b** of base board **23** so as to cover the acting body **21**, melting or collapsing the projections of the stop pins **22c** protruding downside of base board **23** to secure the pressure plate 22 to the base board **23**. In this assembled state, the acting body **21** is fixedly held between the pressure plate 22 and the base board **23**, bringing the conductive parts **21b** of acting body **21** and the electrode parts **23a** of base board **23** into contact.

On the other hand, the operating body **30** is rotatably pivoted on a shaft **31** provided in the central lower part above the resistor main body **20** by a bracket omitted in the graphical presentation. The operating body **30** has pressing parts **32** corresponding to the downside pressed parts **21a** of acting body **21**, and the projections **21a1** for shake prevention upside of pressed parts **21a** are in contact with the pressing parts **32** in the non-pressed state, respectively.

In the variable resistor thus constituted, when the pressed parts **21a** of acting body **21** are pressed downward and deformed by tilting with the shaft **31** of operating body **30** as the center, the conductive resistance of electrode parts **23a** changes with the pressure force.

(Problem overcome by the design)

In the prior variable resistor, gaps formed between the pressing parts **32** and the pressed parts **21a** of acting body **21** are absorbed by the projections **21a1** for shake prevention in the state of mounting the operating body **30**, but the projections **21a1** are formed on the upside (pressed side) of

pressed parts **21a**, therefore, if a plus-side error in height dimension of the projection themselves exists, there the problem that the pressed parts **21a** receive an improper press force in the non-pressed state, and an anticipated resistance change is not obtained in the variable resistor. Similarly, if a minus-side error in the height dimension of the projection exists, there is the problem that gaps are formed and shaking is generated in the operating body **30**.

The present design was made in view of the above problem, and its purpose is to provide a variable resistor that can reliably prevent shaking in the operating body **30** without causing a hindrance in the characteristic resistance value of the variable resistor.

(Problem resolution means)

To achieve the above purpose, the present design is a variable resistor which comprises a resistor main body for changing the conductive resistance of electrode parts with the press deformation of the pressed parts of an acting body made of an elastic material and an operating body having pressing parts capable of pressing the pressed parts and is characterized by vertically providing projections for shake prevention made of an elastic material adjacent to the pressed parts of the acting body, have a larger height dimension than the pressed parts and have their upper ends in contact with the pressing parts of the operating body.

(Functions)

According to the present design, the projections for shake prevention which have a larger height dimension than the pressed parts and their upper ends are in contact with the pressing part of the operating body are vertically provided in positions different from the pressed parts, therefore an improper pressure force is not applied to the extruded parts even if a large height dimension of the projections is formed by considering the minus-side error portion.

(Example)

Fig. 1 to Fig. 3 show an example in which the present design is applied to a seesaw type variable resistor, Fig. 1 is the sectional view of the variable resistor, Fig. 2 is the top view of a resistor main body, and Fig. 3 is the illustrative drawing of operations.

The variable resistor of this example shown in Fig. 1 and Fig. 2 is constructed from a resistor main body **1** and an operating body **10** for press operations.

The resistor main body **1** comprises an acting body **2** receiving the press operation , a pressure plate **3** and a base board **4**.

The acting body **2** is formed of an elastic material such as synthetic rubber, etc. in the shape of a rectangular plate and has two hill-like pressed parts **2a** with flat upper ends on its upside. Conical conductive parts **2b** made of a conductive rubber, etc. are coaxially attached downside of acting body corresponding to the projections **2c** (wrong number "**2a**"?, translator). Rod-like projections **2c** for shake prevention which are adjacent to the pressed parts **2a** and have a larger height dimension than the pressed parts **2a** are provided vertically and integrally with the acting body **2**, respectively.

The pressure plate **3** covers the upside of acting body **2**, has roughly circular holes **3a**, through which the pressed parts **2a** and the rod-like projections **2c** are inserted on the upside and have the pressing surface **3b** in contact with the upside of acting body **2** on the inner side. Engagement pieces **3c** which are longer than the thickness of base board **4** and have a hooklike engagement at the lower end are vertically provided at each side of the pressure plate **3**.

The base board comprises a printed wiring board, etc. and has electrode parts **4a** for which the conductive parts **2b** of acting body **2** is contactable at two locations on its upside. Electrode parts in which two semi-circular resistance films are arranged in the non-contact state and electrodes are connected to the resistance films are used as the electrode parts **4a**. Engagement holes **4b** through which the engagement pieces **3c** of pressure plate **3** can be inserted and engaged are formed corresponding to the engagement pieces.

This resistor main body **1** is simply assembled by mounting the acting body **2** on the base board **4**, inserting the engagement pieces **3c** of pressure plate **3** into the engagement holes **4b** of base board **4** and stopping them so as to cover the acting body **2**. In the assembled state, the acting body **2** is fixedly held between the pressure plate **3** and the base board **4**, and the conductive parts **2b** of acting body **2** and the electrode parts **4a** of base board **4** are opposite at a prescribed spacing.

On the other hand, in the operating body **10** is rotatably pivoted above the resistor main body **1** on a shaft **11** provided in the central lower part by a bracket omitted in the graphical presentation. The operating body **10** has rectangular pressing parts **12** corresponding to the pressed parts **2a** of acting body **2**, respectively, the upper ends of the rod-like projections **2c** for shake prevention are in contact with the pressing parts **32** in the non-extruded state, respectively.

Operations of the above-mentioned variable resistor are described next with reference to Fig. 3.

In Fig. 3, if the top left side of the operating body **10** is pressed with a finger tip, etc., the operating body **10** is tilted in the counterclockwise direction with the shaft **11** as center, first the rod-like projections **2c** for shake prevention in contact with the left-side pressing part **12** flex, shortly the pressing part **12** makes contact upside of the pressed part **2a**, the pressed part **2a** is pressed down and deformed, and the conductive parts **2b** on the downside of pressed parts **2a** makes contact with the electrode parts **4a**. The contact area of the conductive parts **2b** increases with the pressure force, changing the conducting resistance of electrode parts **23a**.

If the pressing onto the operating body **10** is released, the pressed parts **2a** of acting body **2** and the rod-like projections **2c** for shake prevention are restored to the original state by their own elasticity, respectively, and the downside of operating body **10** is supported by the rod-like projections **2c** again to prevent shaking.

Thus, in the above-mentioned variable resistor, the rod-like projections **2c** for shake prevention adjacent to the pressed parts **2a** and have a larger height dimension than the pressed parts **2a** are vertically provided upside of acting body **2** and their upper ends make contact with the pressing parts **12** of operating body **10**. Therefore, even when a plus-side error in height dimension of the rod-like projections **2c** for shake prevention is generated, the rod-like projections **2c** flex more or less, and improper press force is not applied to the pressing parts **12** in the non-pressed state, thereby obtaining anticipated resistance change in the variable resistor, making it possible to form a large height dimension of the rod-like projections **2c** for shaking prevention beforehand by considering a minus-side error portion, accurateliy bringing the upper ends of the rod-like projections **2c** into contact with the pressing parts **12** of operating body **10** to reliably prevent shaking of operating body **10**.

The case of applying the present design to the seesaw type variable resistor was shown in the above example. However, the present design may also be applied in other types of variable resistors with one, three or more pressed parts. Moreover, electrode parts using a resistance film were shown as the electrode parts **4a**, but electrode parts using a pressure-sensing conductive material the same as

in the prior example may also be used. Furthermore, the case of forming the projections for shake prevention in the shape of rod was shown, but various shapes of projections may be adopted if the projections are in contact with the pressing parts and may prevent the shaking.

(Efficacy of the design)

As described in detail above, according to the present design, the projections for shake prevention flex more or less and an improper press force is not applied to the pressing parts of the acting body in the non-pressed state, thereby obtaining anticipated resistance change in the variable resistor even if a plus-side error in the height dimension of projections is generated. Moreover, it becomes possible to form a large height dimension of projections beforehand by considering a minus-side error, therefore the upper ends of the projections may be accurately brought into contact with the pressing parts of operating body to reliably prevent shaking of the operating body.

4. Brief description of the drawings

Fig. 1 to Fig. 3 show an example of applying the present design to a seesaw type variable resistor Fig. 1 is the sectional view of the variable resistor, Fig. 2 is a top view of a resistor main body, Fig. 3 is the illustrative drawing of operations, and Fig. 4 is the sectional view of the prior variable resistor.

In the drawings,

1	resistor main body
2	acting body
2a	pressed body
2c	rod-like projection for shake prevention
4a	electrode part
10	operating body
12	pressing part

1	resistor main body
2	acting body
2a	pressed body
2c	rod-like projection for shake prevention
4a	electrode part
10	operating body
12	pressing part

Sectional view of variable resistor

[Fig. 1]

Top view of resistor main body

[Fig. 2]

1	resistor main body
2	acting body
2a	pressed body
2c	rod-like projection for shake prevention

4a electrode part

10 operating body

12 pressing part

Illustrative drawing of operations

[Fig. 3]

20 resistor main body

21 acting body

21a pressed body

21a1 projection

23a electrode part

30 operating body

32 pressing part

Sectional view of prior variable resistor

[Fig. 4]

CERTIFICATE OF TRANSLATION

I Roger P. Lewis, whose address is 42 Bird Street North, Martinsburg WV 25405, declare and state the following:

I am well acquainted with the English and Japanese languages and have in the past translated numerous English/Japanese documents of legal and/or technical content.

I hereby certify that the Japanese translation of the attached translation of documents identified as:

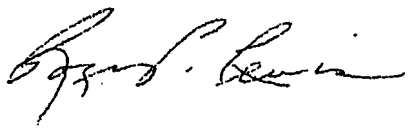
Utility Model Application

H3-61304

"Variable Resistor"

is to the best of my knowledge and ability true and accurate.

I further declare that all statements contained herein of our own knowledge, are true, that all statements of information and belief are believed to be true.



ROGER P. LEWIS

October 24, 2006

AL MINISTERO DELL'INDUSTRIA DEL COMMERCIO E DELL'ARTIGIANATO
UFFICIO CENTRALE BREVETTI - ROMA
DOMANDA DI BREVETTO PER INVENZIONE INDUSTRIALE, DEPOSITO RISERVE ANTICIPATA

N.G.

A. RICHIEDENTE (I)

1) Denominazione ZUKIN MARCIO — PF
Residenza MILANO VIA POPOLI UNITI 20 — codice ZKNMRC66C01Z602Q

2) Denominazione RANZANI PAOLO CARLO — PF
Residenza MILANO VIA FORNARI 10 — codice RNZPCR63R13F205I

B. RAPPRESENTANTE DEL RICHIEDENTE PRESSO L'U.C.B.

cognome nome // — cod fiscale
denominazione studio di appartenenza //
via // — n. — città // — cap — (prov)

C. DOMICILIO ELETTIVO DESTINATARIO RANZANI PAOLO CARLO C/O F.LLI RANZANI
via SALVO D'ACQUISTO — n. 18 — città SIZIANO — cap 27010 — (prov) PV

D. TITOLO — classe proposta (sez/cl/scl) — gruppo/sottogruppo

TASTIERA A RETROAZIONE TATTILE A VIBRAZIONE

ANTICIPATA ACCESSIBILITÀ AL PUBBLICO: SI — NO X — SE ISTANZA: DATA — N° PROTOCOLLO

E. INVENTORI DESIGNATI cognome nome — cognome nome

1) ZUKIN MARCIO — 3)
2) RANZANI PAOLO CARLO — 4)

F. PRIORITÀ

nazione o organizzazione	tipo di priorità	numero di domanda	data di deposito	allegato S/R	SCIOGLIMENTO RISERVE Data	N° Protocollo
1)						
2)						

G. CENTRO ABILITATO DI RACCOLTA COLTURE DI MICRORGANISMI, denominazione

H. ANNOTAZIONI SPECIALI

DOCUMENTAZIONE ALLEGATA

	N. es.				SCIOGLIMENTO RISERVE Data	N° Protocollo
Doc. 1)	1	PROV	n. pag 108	riassunto con disegno principale, descrizione e rivendicazioni (obbligatorio 1 esemplare)		
Doc. 2)	0	PROV	n. tav	disegno (obbligatorio se citato in descrizione, 1 esemplare)		
Doc. 3)	0	RIS		lettera d'incarico, procura o riferimento procura generale		
Doc. 4)	0	RIS		designazione inventore		
Doc. 5)	0	RIS		documenti di priorità con traduzione in italiano	confronta singole priorità	
Doc. 6)	0	RIS		autorizzazione o atto di cessione		
Doc. 7)	0			nominativo completo del richiedente		

8) attestati di versamento, totale lire 159.000 (centocinquantanovemila) — obbligatorio
9) marche da bollo per attestato di brevetto di lire 10.000 (diecimila°) — obbligatorio

COMPILATO IL 09/12/1991 — FIRMA DEL(I) RICHIEDENTE (I) [signatures]
CONTINUA SI/NO NO
DEL PRESENTE ATTO SI RICHIEDE COPIA AUTENTICA SI/NO NO

UFFICIO PROVINCIALE IND. COMM. ART. DI MILANO — codice 15
VERBALE DI DEPOSITO — NUMERO DI DOMANDA MI 91 A 003315 — Reg.A
L'anno millenovecento Novantuno — il giorno Undici — del mese di Dicembre
il(i) richiedente(i) sopraindicato(i) ha(hanno) presentato a me sottoscritto la presente domanda, corredata di n. 00 fogli aggiuntivi per la concessione del brevetto soprariportato.

I. ANNOTAZIONI VARIE DELL'UFFICIALE ROGANTE

IL DEPOSITANTE [signature]

L'UFFICIALE ROGANTE
Polenghi A.

PROSPETTO A

RIASSUNTO INVENZIONE CON DISEGNO PRINCIPALE, DESCRIZIONE E RIVENDICAZIONE

NUMERO DOMANDA L MI 91 A 003315 REG. B DATA DI DEPOSITO L_L/L_L/L_L_L

NUMERO BREVETTO L_____ DATA DI RILASCIO L_L/L_L/L_L_L

D. TITOLO

TASTIERA A RETROAZIONE TATTILE A VIBRAZIONE

L. RIASSUNTO

Tatiera di comando per apparecchiature elettriche od elettroniche in cui la retroazione dell'avvenuto comando viene inoltrata allo operatore mediante vibrazione del tasto stesso.

M. DISEGNO

MI 91 A/033 15

DESCRIZIONE DI INVENZIONE INDUSTRIALE

Descrizione dell'INVENZIONE INDUSTRIALE dal titolo: "TASTIERA A RETROAZIONE TATTILE A VIBRAZIONE" a nome dei Sigg.

Zukin Marcio nato a Rio De Janeiro -Brasile- il 01/03/1966 residente a Milano in via Popoli Uniti 20

Ranzani Paolo nato a Milano il 13/10/1963 residente a Milano in via Fornari 10

RIASSUNTO

Tastiera di comando per apparecchiature elettriche/elettroniche in cui la retroazione dell'avvenuto comando, viene inoltrata all'operatore mediante vibrazione del tasto stesso.

STATO ATTUALE DELLA TECNICA

Sono note le tastiere o pulsantiere di comando che quotidianamente vengono azionate nelle piu' diversificate applicazioni: calcolatrici, telefoni, ascensori, distributori automatici, elettrodomestici etc.

Le attuali tastiere presentano tipologie costruttive variabili anche in funzione della applicazione; si hanno pertanto tastiere a

microinterruttori, a membrana, capacitive etc.

Elemento essenziale dell'apparecchiatura e' un contatto, meccanico od elettronico, che viene chiuso, ovvero messo in conduzione, quando il tasto viene premuto dall'operatore.

L'informazione che il tasto e' stato effettivamente premuto puo' pervenire all'operatore in diversi modi: rumore meccanico del tasto, segnalazione acustica, segnalazione luminosa, innesco delle operazioni comandate dal tasto, etc.

In applicazioni di largo consumo od in ambienti industriali particolarmente ostili, si preferisce utilizzare tastiere a membrana o capacitive per la loro maggiore resistenza meccanica ed alla penetrazione di agenti esterni come polvere, umidita', trucioli di lavorazione.

Tali tastiere non danno una retroazione "meccanica" a causa della loro tecnologia costruttiva, si deve pertanto ricorrere alla segnalazione acustica o luminosa.

Nel caso in cui l'operatore sia non udente o non vedente o comunque si trovi in ambienti rumorosi o malamente illuminati, egli non puo' definire con

certezza l'avvenuto comando.

Il ritrovato in oggetto elimina o riduce i suddetti inconvenienti risolvendo anche completamente alcuni problemi come qui di seguito illustrato.

DESCRIZIONE DEL RITROVATO

Secondo il ritrovato si prevede una risposta all'operatore mediante la vibrazione del tasto premuto.

La retroazione agisce pertanto sul tatto dell'operatore, lasciando liberi, se efficienti, gli altri sensi.

Secondo una struttura preferenziale, il ritrovato si presenta come una normale tastiera a membrana sotto alla quale vengono applicati dei trasduttori piezoelettrici, che, eccitati ad una opportuna frequenza, mettono in vibrazione il tasto stesso.

In una variante si prevede che lo stesso trasduttore piezoelettrico funzioni contemporaneamente anche da tasto, in quanto esso genera una tensione proporzionale alla sollecitazione meccanica applicata.

Allo scopo di rendere idoneo il ritrovato anche ad applicazioni gia' esistenti, il trasduttore

potrebbe essere posizionato anche sul lato anteriore del tasto.

VANTAGGI

Sono evidenti i vantaggi del ritrovato.

Con una tastiera avente aspetto esteriore uguale a quello dei modelli esistenti, si allarga la possibilita' di uso di certe apparecchiature anche a persone handicappate o l'uso di apparecchiature in ambienti particolarmente ostili.

All'operatore non viene richiesta nessuna attenzione particolare e l'uso del ritrovato non presenta complicazioni aggiunte.

Ovviamente sono innumerevoli le varianti possibili.

Ad esempio al posto di un trasduttore piezoelettrico se ne puo' usare uno di tipo magnetodinamico, o di tipo magnetostrittivo.

Pertanto deve essere inteso che nella domanda di privativa sia compresa ogni equivalente applicazione dei concetti ed ogni equivalente prodotto attuato e/o operante secondo una o piu' qualsiasi delle caratteristiche indicate nelle seguenti:

RIVENDICAZIONI

1) Tastiera a retroazione caratterizzata da cio' che la retroazione viene inviata all'operatore mediante azione vibratoria del tasto stesso.

2) Tastiera a retroazione come alla rivendicazione 1), caratterizzata da cio' che la vibrazione inzia dopo che il tasto e' stato effettivamente premuto.

3) Tastiera a retroazione come alle rivendicazioni 1) e 2), caratterizzata da cio' che la vibrazione viene generata da un trasduttore piezoelettrico.

4) Tastiera a retroazione come alle rivendicazioni da 1) a 3), caratterizzata da cio'che il trasduttore piezoelettrico viene pilotato da un circuito elettronico.

5) Tastiera a retroazione come alle rivendicazioni da 1) a 4), caratterizzata da cio'che la tastiera ha forme usuali e pertanto e' di uso istintivo.

6) Tastiera a retroazione come alle rivendicazioni da 1) a 5), caratterizzata da cio'che il trasduttore puo' essere anche di tipo differente.

7) Tastiera a retroazione come alle rivendicazioni da 1) a 6), caratterizzata da cio'che il trasduttore puo' essere posizionato anche sulla faccia anteriore della tastiera.

8) Tastiera a retroazione come alle rivendicazioni da 1) a 7), caratterizzata da cio'che il

trasduttore stesso puo' fungere da tastiera.

9) Tastiera a retroazione come alle rivendicazioni da 1) a 8), caratterizzata da cio'che l'innesco della vibrazione puo' essere determinato dalla effettiva attuazione della operazione legata alla prressione del tasto.

10) Tastiera a retroazione come alle rivendicazioni da 1) a 9), caratterizzata da cio'che la frequenza di vibrazione del tasto puo' essere differenziata per indicare diversi tipi di azione.

11) Tastiera a retroazione come alle rivendicazioni da 1) a 10), caratterizzata da cio'che il trasduttore sia applicato alla tastiera mediante incollaggio od altro mezzo.

12) Tastiera a retroazione come alle rivendicazioni da 1) a 11), caratterizzata da cio'che il circuito elettronico di pilotaggio del trasduttore sia montato su una scheda separata.

13) Tastiera a retroazione come alle rivendicazioni da 1) a 12), caratterizzata da cio'che il circuito elettronico di pilotaggio venga integrato nel trasduttore stesso.

14) Tastiera a retroazione come alle

rivendicazioni da 1) a 13), caratterizzata da cio'che il sistema possa essere applicato anche su tastiere preesistenti.

Il tutto sostanzialmente come descritto ed illustrato e per gli scopi specificati.

DESCRIPTION OF AN INDUSTRIAL INVENTION

Description of the INDUSTRIAL INVENTION having the title: "KEYBORD WITH VIBRATING TACTILE FEEDBACK" to

Mr Zukin Marcio born in Rio De Janeiro – Brazil – on 01/03/1966 resident in Milan at via Popoli Uniti 20

Mr Ranzani Paolo born in Milan on 13/10/1963 resident in Milan at via Fornari 10

ABSTRACT

Command keyboard for electrical/electronic apparatuses in which the feedback of a command that has occurred is transmitted to the operator through vibration of the button itself.

BACKGROUND OF THE INVENTION

Keyboards or keypads are known that are actuated daily in the most different applications: calculators, telephones, lifts, cash machines, domestic appliances, etc.

Current keyboards have variable embodiments also according to the application; therefore there are microswitch, membrane, capacitative keyboards, etc.

An essential element of the apparatus is a contact, mechanical or electronic, which is closed, i.e. made to conduct, when the button is pressed by the operator.

The operator can be informed that the button has actually been pressed in different ways: mechanical noise of the button, acoustic signal, light signal, triggering of the operations commanded by the button, etc.

In widely used applications or in particularly hostile industrial environments, it is preferred to use membrane or capacitative keyboards due to their greater mechanical strength and the penetration of impurities like dust, humidity and processing chips.

Such keyboards do not give "mechanical" feedback due to their constructive technology and therefore acoustic or light signals must be used.

In the case in which the operator is deaf or blind or in any case is in noisy or poorly lit environments, he cannot be certain of whether a command has occurred.

The invention in object eliminates or reduces the aforementioned drawbacks also completely solving some problems as illustrated hereafter.

DESCRIPTION OF THE INVENTION

According to the invention, a response to the operator through the vibration of the pressed button is foreseen.

The feedback therefore acts on the operator's sense of touch, leaving the other senses free, if they work.

According to a preferential structure, the invention is in the form of a normal membrane keyboard under which piezoelectric transducers are applied that, excited at a suitable frequency, make the button itself vibrate.

In a variant it is foreseen for the same piezoelectric transducer to simultaneously operate as a button, since it generates a voltage proportional to the mechanical stress applied.

In order to make the invention also suitable for applications that already exist, the transducer could also be positioned on the front side of the button.

ADVANTAGES

The advantages of the invention are clear.

With a keyboard having the same appearance as existing models, the possibility of using certain apparatuses is extended to handicapped people or it becomes possible to use apparatuses in particularly hostile environments.

The operator does not have to pay any special attention and the use of the invention has no additional complications.

Obviously, the possible variants are numerous. For example, instead of a piezoelectric transducer, a magnetodynamic or magnetostrictive transducer can be used.

Therefore, it should be understood that the patent application covers any equivalent application of the concepts and any equivalent product made and/or operating according to any one or more of the characteristics indicated in the following:

CLAIMS

1) Keyboard with feedback characterized in that the feedback is sent to the operator through vibration of the button itself.

2) Keyboard with feedback according to claim 1), characterized in that the vibration begins after the button has actually been pressed.

3) Keyboard with feedback according to claims 1) and 2), characterized in that the vibration is generated by a piezoelectric transducer.

4) Keyboard with feedback according to claims 1) to 3), characterized in that the piezoelectric transducer is controlled by an electronic circuit.

5) Keyboard with feedback according to claims 1) to 4), characterized in that the keyboard is the normal shape and is therefore instinctive to use.

6) Keyboard with feedback according to claims 1) to 5), characterized in that the transducer can also be of a different type.

7) Keyboard with feedback according to claims 1) to 6), characterized in that the transducer can also be positioned on the front face of the keyboard.

8) Keyboard with feedback according to claims 1) to 7), characterized in that the transducer itself can acts as a keyboard.

9) Keyboard with feedback according to claims 1) to 8), characterized in that the triggering of the vibration can be brought about by the actual actuation of the operation linked to the pressing of the button.

10) Keyboard with feedback according to claims 1) to 9), characterized in that the frequency of vibration of the button can be differentiated to indicate different types of action.

11) Keyboard with feedback according to claims 1) to 10), characterized in that the transducer is applied to the keyboard through gluing or another means.

12) Keyboard with feedback according to claims 1) to 11), characterized in that the electronic control circuit of the transducer is mounted on a separate board.

13) Keyboard with feedback according to claims 1) to 12), characterized in that the electronic control circuit is integrated in the transducer itself.

14) Keyboard with feedback according to claims 1) to 13), characterized in that the system can also be applied onto pre-existing keyboards.

All as substantially described and illustrated and for the specified purposes.